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Defect modes of one-dimensional photonic-crystal structure with a resonance nanocomposite layer

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Abstract

© 2016 Kvantovaya Elektronika and Turpion Ltd.We have studied the defect modes of a structure of Fabry-Perot interferometer type, in which the layer separating Bragg mirrors is made of a heterogeneous composite material with metallic nanoscale inclusions. Effective optical characteristics of the nanocomposite material have resonance singularities in the visible region of the spectrum, which are conditioned by the surface plasmon resonance of metallic nanoparticles. It is shown that the spectral profile of the energy bandgap of the photonic structure can be modified by varying the volume fraction and size of nanoparticles. The interrelation of splitting and shift of defect modes with structural parameters of a nanocomposite layer is studied by means of a numerical-graphical method with allowance for the frequency dependences of phases and amplitudes of reflectances in Bragg mirrors.

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Keywords

Defect modes, Nanocomposite medium, Photonic crystal, Plasmon resonance